DETAILED ACTION

1. Receipt of the papers filed on December 21, 2009, is acknowledged.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 112

3. Claim 1, 3-5, 9, 10, 13-19, 27, 44, 48-51, 53, 55, 58, 60-70 and 72-74 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. After reciting a step of depositing seeds in a localized range on the active substrate and a step of spontaneously displacing the active substrate, claim 1 recites a step of continuing depositing in a localized range and a step of growing the deposit. The relationship of these steps is not clear. In particular, it is not clear what is required by the steps of "continuing" and "growing". In the Remarks, applicant argues that Fang teaches aqueous electrochemical copper deposition after seeding with copper and palladium deposited from an organic solution, and states that "Nowhere does Fang teach continuing depositing from a non-aqueous organic, non-conducting solution." This argument appears to suggest that in the process of Fang, after initial deposition from an organic solution, deposition continues in an aqueous solution, while in the process of claim 1 after the initial deposition from an organic solution (which is equivalent to that of Fang) deposition then continues from the same organic solution. For the reasons given in paragraph 14 of the previous office action and discussed below in the Response to Amendment, this continued deposition from the same organic solution appears to be contrary to the accepted

mechanism of displacement plating. Thus, it is not clear what is required by the step of "continuing".

5. Claims 1, 3-5, 9, 10, 13-19, 27, 44, 48-51, 53, 55, 58, 60-70 and 72-74 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

6. Applicant has amended claim 1 to recite that the organic solution is "non-conducting". Basis for this expression in the specification as filed is not apparent. At page 12, lines 24-26 of the specification it is stated that "The organic solution of the present invention has low conductivity (e.g., 10^{-8} to 10^{-6} S/Cm as opposed to 10^{-1} for a prior art aqueous solution." To the extent that "non-conducting" means something other than "low conductivity" as originally disclosed, the term is considered to introduce new matter.

Claim Rejections - 35 USC § 102

7. Claims 1, 3-5, 9, 10, 14, 15, 27, 44, 48, 50, 51, 53, 55, 58, 63, 64, 66, 67, 69, 70, 72 and 73 are rejected under 35 U.S.C. 102(b) as being anticipated by the Fang et al article for the reasons of record.

Claim Rejections - 35 USC § 103

8. Claims 13 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Fang et al article "An Alternative Metallic Seeding Technique for Subsequent Electrochemical Deposition of Copper onto Barrier Metals" alone or in view of O'Keefe (US 5,228,903) for the reasons of record.

9. Claims 16-19, 62, 65 and 72 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Fang et al article "An Alternative Metallic Seeding Technique for Subsequent Electrochemical Deposition of Copper onto Barrier Metals" as applied to claims 1, 3-5, 9, 10, 14, 15, 27, 44, 48, 50, 51, 53, 55, 58, 63, 64, 66, 67, 69, 70 and 73 above, and further in view of the Lowenheim text *Electroplating* for the reasons of record.

10. Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Fang et al article "An Alternative Metallic Seeding Technique for Subsequent Electrochemical Deposition of Copper onto Barrier Metals" as applied to claims 1, 3-5, 9, 10, 14, 15, 27, 44, 48, 50, 51, 53, 55, 58, 63, 64, 66, 67, 69, 70 and 73 above, and further in view of the Lowenheim text *Modern Electroplating* and Cimermancic et al (6,284,123) for the reasons of record.

11. Claim 74 is rejected under 35 U.S.C. 103(a) as being unpatentable over the Fang et al article "An Alternative Metallic Seeding Technique for Subsequent Electrochemical Deposition of Copper onto Barrier Metals" as applied to claims 1, 3-5, 9, 10, 14, 15, 27, 44, 48, 50, 51, 53,

55, 58, 63, 64, 66, 67, 69, 70 and 73 above, and further in view of O'Keefe (US 5,228,903) for the reasons of record.

Response to Amendment

12. The Declaration under 37 CFR 1.132 filed December 21, 2009, is insufficient to overcome the rejection of claims 1, 3-5, 9, 10, 13-19, 27, 44, 48-51, 53, 55, 58, 60-70 and 72-74 based at least in part upon the Fang et al article "An Alternative Metallic Seeding Technique for Subsequent Electrochemical Deposition of Copper onto Barrier Metals" as set forth in the last Office action.

13. The Declaration does not specify whether it has been filed under 37 CFR 1.131 or 37 CFR 1.132. From the subject matter of the Declaration is it assumed to have been filed under 37 CFR 1 132. In paragraph 1 of the Declaration it is stated that the process of Fang et al is a deposition method consisting of three separate steps. The first is seeding from an organic solution, the second includes rinsing with water, and the third is performing electrolytic or electroless copper deposition. In paragraph 2 of the Declaration it is stated that Fang et al do not disclose the deposition process of the present invention which never uses electrolytic or electroless deposition from an aqueous electroplating bath; the present invention teaches a deposition method using only a non-aqueous non-conducting organic solution. These statements are not persuasive because applicant's claims are written in open form using the term comprising. The claims may include steps in addition to those recited. It is the Examiner's position that in the process of Fang et al, the step of depositing a seed layer from an organic solution corresponds to the deposition from an organic solution recited in applicant's claim 1, and similarly

corresponds to step i. described in paragraph 1 of the Declaration. The additional steps of ii. rinsing and iii. electroless or electrolytic deposition are not excluded from applicant's claims.

14. Applicant's arguments filed December 21, 2010, have been fully considered but they are not persuasive. At pages 10 and 11 of the Remarks, applicant refers to the Declaration and argues that Fang teaches aqueous electrochemical copper deposition after seeding with organic solution-deposited copper and palladium. Applicant states that "Nowhere does Fang teach continuing depositing from a non-aqueous organic, non-conducting solution." This is the same argument applicant advanced at page 11 of the Remarks submitted on May 19, 2009, where applicant stated "Nowhere does Fang teach or render obvious continuing plating the desired deposition galvanic coating component from the non-aqueous organic solution. Fang teaches away from plating from an organic solution: Fang teaches continuing plating from a conventional aqueous electrochemical solution." This argument remains unconvincing.

15. Applicant's process relates to a galvanic coating process. As stated at page 15, line 10 of the specification "In principle, the galvanic coating process of the present invention is a cementation reaction. The major difference is the nature of the liquid media in which the reactions occur. Instead of the aqueous solution of the prior art, an organic solution is utilized in the present invention." Applicant's process is illustrated in figures 1a, 1b and 1c and described at page 10, line 21 to page 11, line 5 of the specification. Figure 1a shows noble metal atoms complexed with an organic compound 10 in solution 12, in the initial stage. Figure 1b shows the noble metal atoms complexed with an organic compound 10 are reduced at cathodic sites on the active substrate 14 to the metallic state 18 (e.g. gold atoms). Simultaneously, the active metal

atoms are oxidized into the organic solution and form a soluble complex 16. Noble metal atoms 18 (e.g., gold atoms) begin to deposit on active substrate 14. Figure 1c shows deposited noble metal atoms 19 covering active substrate 14, preferably forming a noble metal film layer (e.g., a gold film layer).

16. As explained at pages 14 and 15 of applicant's specification a cementation reaction (displacement reaction) involves using a less noble metal to serve as a reducing agent for a more noble cation. From this teaching it is clear that once a complete layer of the more noble metal has formed, as shown in figure 1c, the less noble is no longer exposed to the plating solution and the displacement reaction will cease. This phenomenon is well-known in the art as shown by the description in the Lowenheim text *Electroplating*. Initially, it is noted that the terms displacement, cementation and immersion plating are synonymous as shown by Lowenheim at page 389. As explained by Lowenheim, for displacement plating "the thickness of deposits obtainable is usually extremely limited, because as soon as the substrate metal is completely, or almost completely, covered by the deposit, the reaction stops or slows down to the rate at which substrate metal is available through pores or discontinuities in the coating." See page 411.

17. Thus, the deposition recited in claim 1 must necessarily stop when the active substrate is covered. That is, the deposition process of claim 1 can continue only until a complete layer of the desired galvanic coating component has formed as shown in figure 1c. Deposition cannot continue past this point in time. Applicant's argument is not persuasive because Fang teaches continuing deposition from the organic solution to the same extent as applicant. Fang et al states that the displacement plating process is self-limiting in thickness. "The reaction stops once the less noble metal surface has been covered by the more noble metal." See page 138. Thus, the

deposition from the non-aqueous organic solution of Fang continues to the same extent as the deposition from the non-aqueous organic solution of applicant, i.e., until a complete layer has been deposited. The disclosure that Fang additionally continues deposition by electroless or electroplating in a separate process step after completion of deposition from the organic solution does not alter the disclosure that deposition from the organic solution itself continues to the same extent as that of applicant.

18. The arguments advanced by applicant at pages 12 and 13 of the Remarks are similar and, for the reasons given above, are not persuasive.

Conclusion

19. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM T. LEADER whose telephone number is (571) 272-

1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/William Leader/
May 21, 2010

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